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SENSATION AND PERCEPTION

II. THE ANALYTIC RELATION

THE preceding article on the genetic relation of sensation to perception contained a criticism of the doctrine that sensations are genetically prior to perceptions and form the raw material of the latter, together with a presentation of the alternative doctrine that the capacity for experiencing qualitatively distinct sensations is conditioned by the functional differentiation of the sensory centers in the cortex, and is thus a product of the same process of development that issues in the formation of perceptions. I wish now to consider more fully what the conditions are which determine the experiencing of specific sensations, and how such experience is related to perception. The inquiry of the present paper is directed not so much to determine on what the general *capacity* for sensation depends, as to determine the conditions under which sensations actually are experienced. It is thus the problem of the analytic relationship of sensation to perception with which we are to deal. In this field, as elsewhere, it is to be expected that genetic and analytic investigations will be of mutual service.

If we compare sensation with perception in their relation to behavior we find ourselves at once face to face with a striking and fundamental difference. The sensation has no direct relationship at all to behavior. Sensation-qualities in themselves call for nothing determinate in the way of response. Whiteness, pressure, warmth, C_3 *may* lead us to practically any sort of response of which we are capable; but what particular response, or modification of response, any one of them actually calls out depends, in the first place, upon the objective whole to which it belongs, and, in the second place, on the situation. Abstracted from an object and isolated from a situation, it leaves us perfectly indifferent as to how we shall act. It is indeterminate in its relation to behavior. Perception, on the other hand, being the apprehension or awareness of an *object,* stands in a determinate, albeit indirectly determinate, relation to behavior. If there is no one inevitable response to an apple, a dog, a tree, or a man, there is at least a set of alternative possible modes of response within which the actual response will probably fall. Our customary and appropriate ways of treating an apple are characteristically different from our customary and appropriate ways of treating a dog, or a man. Just what particular response is demanded by an object on any given occasion depends on the situation of which the object is a constituent or factor. As a matter of fact, it is just this characteristic relationship to behavior which constitutes the very essence of objectivity. A certain complex of nervous excitations, *e. g.*, the "visual appearance," the "smell," the "feel" of the apple, have become organized into a percept solely through the fact that they have come to call out a distinctive sort of behavior, have become coordinated into a functional whole. So again, a complex group of retinal excitations become organized into a visual perception of an apple because it has come to function as a whole in determining response.

The same contrast between sensation and perception appears again if we compare the properties of things which are most clearly related to simple sensation qualities—as color—with those properties which are apprehended through perception, as shape and size. Generally speaking, there is no sort of behavior which is demanded by blue objects, or by objects which feel "cold," or taste "sour." The shapes of things, on the contrary, and their sizes, demand appropriate treatment. If you take hold of a square-cornered object, you grasp it differently, and handle it differently, from the way you grasp and handle a round object. Similarly with its size and weight and position. These all call for a fairly definite set of possible muscular adjustments.

The fact that sensation stands toward behavior in so different a relationship from that of the percept is of the utmost significance for an adequate theory as to the place and function of sensation in experience. It is really this fact of the functional indeterminateness, or what we may call the *functional independence,* of the sensation which enables the psychologist to treat the sensation as a structural element, a simple process which has no meaning, and which by itself can (as Professor Titchener says) do nothing but go on. It is from this central fact of its functional indeterminateness that we must interpret the doctrine that the sensation is an element into which the so-called perceptual complex may be resolved, and in terms of which it is to be construed, a doctrine hopelessly unintelligible from the conventional standpoint of analytic psychology.

The difficulties in the traditional treatment of the sensation as an element I have discussed in a former article.[1] It may, however, be worth while to consider them further in the present connection.

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[1] "The Psychological Element," *The Phil. Rev.*, July, 1915.

According to the current doctrine we never experience a sensation "pure" or by itself, but always as a constituent or factor in a complex. We are, however, led to believe that there are such things as sensations because, when one of these complexes is analyzed by introspection, we find ourselves able to attend to color quality, or pressure quality, or tone quality, in disregard of the fact that it is the color of a piece of paper, or the pressure of a pencil, or the tone of an organ. However, this simple sensation, thus isolated by attention, is experienced as somehow different, by virtue of the very fact of attention. The sensation as it really is in the complex can be known only by analogy to the sensation as isolated by analysis. For this reason the sensation is said to be an abstraction, or an artifact, comparable to the atom or the ion, an existent, that is, which is postulated for the purposes of scientific construction. Now any whole, whether it be a loaf of cake, an engine, or the human body, is analyzed into constituents or factors solely in so far as these constituents may be conceived to enable us to account for the properties and behavior *of that whole.* In order to meet this requirement, the elements found, or postulated, must themselves have definite properties, and such properties as can account for the properties of the whole. Thus the properties postulated of the ion, or discovered to belong to the cell, are relevant to the properties of the atom or to those of the organism, and help us to understand these latter. It is only as the bearer of these relevant properties, indeed, that the ion is postulated at all, and the same may be said in its turn of the atom. But in the case of the sensation the situation is altogether different. The sensation, even if the psychologist could consent to accept it as an entity capable of behavior, has no known properties or modes of behavior which help us to understand the complexes into which it enters. It is in itself, indeed, merely an hypostatized *quality.* The properties or characteristics of the complex are not conceivable as resultants or products of the joint activity of the constituent sensations. The one salient feature of the percept, that which makes it a whole—namely, that it is meaningful—is quite unaccountable so long as we treat it as a "complex" of sensations. No scientific doctrine was ever more futile or barren of results than this doctrine that the percept is a complex of sensations.

The only ground for supposing that perceptions contain sensation elements at all is the fact that if a given perception is lost under certain circumstances, when, as the psychologist says, it is "pulled to pieces" by psychological analysis, we experience determinate sensation qualities. Now it is only metaphorically that we can speak of "pulling a perception to pieces," or "breaking it up," or even of "analyzing" it into elements. For in the very act of performing the "analysis" the perception disappears. It is not that the whole is destroyed as a result of the analysis, as always happens as the result of any analysis, but that in the very shift of attention necessary to introspection the perception has vanished utterly. We no longer "see" or "feel" or "hear" the object, but only variegated patches of color and the pull of eye-muscles, or the coldness and pressure and strain, or shrill sounds and beats. The assumption that these are to be identified as elements of the perception which preceded them and which we may alternate with the perceived object at will, rests on a very natural confusion. The continuity exists solely in the *objective conditions,* and the only intelligible identity is that of the *external stimulus* now and then. Indeed, it may be asserted that the only identity ever recognized, or that we are capable of recognizing, is an identity of reference. If there be such a thing as a purely existential identity between the content of one moment's experience and that of the next, it certainly does not obtain in this case.

In thus urging that psychological analysis is not an analysis of a psychical complex, I am not arguing for a view like that held by William James, that it is an analysis of the object. For the sensation "elements" reached are no more truly elements of the object than of the percept. Take the case of a visual perception. My hat lies on the desk before me. Looking "at" it, I put myself in the attitude of the psychological observer. The familiar hat disappears and I see an area of markedly variegated browns and grays and blacks and flecks of brightness, with another equally, but differently, variegated mass rising at one end. Now these patches of differing color I should never think of attributing to my hat as "its" color or colors. I distinctly see grays and blacks; but my hat is a uniform *brown* of rough straw, with a darker *brown* feather; and if I were to "match" the straw or the feather with silk or velvet, I should never think of looking for such a mass of variegated tints and hues. Furthermore, the difference in shade which I attribute to the straw and feather as really "their" difference in shade, is not to be identified with the difference between any one of the patches of color in the mass at the end (the feather) and any one of the patches of the main mass (the straw). It is literally true that when I am looking for the contrast between straw and feather I do not see these patches, just as when I see these patches I do not see the "real" color of straw and feather. Again, in the dark I pick up an object and recognize it as this same hat by its familiar rough texture and flexible shape. But if, as I pick it up, I introspect, and note the varying pressures, and even pains, and the pull of muscles, these sensation qualities I can not conceivably attribute to the hat as making up its roughness and shape. In these so-called cases of analysis, we are not, strictly speaking, "analyzing" at all, for the elements we come out with are not truly elements or factors of any whole, either objective or subjective. What has happened is that *the same objective stimuli are being responded to differently* on the two occasions. There is indeed a sameness, an identity there, but it is an identity, not in what I *perceive,* but in what I know by reflection to be there.

If the preceding contentions are just, it follows that sensations are analytic elements of our experience only in a very unusual and questionable sense. The doctrine, indeed, that they are results of analysis is but the counterpart of the time-honored doctrine that perceptions are the products of a synthesis conceived either as an organizing act of the mind, or as a structure produced by the associative agency of the elements themselves. There was a time—and the tendency still lingers in some quarters—when perception was regarded as a sort of condensed or sub-conscious inference operating on given and immediate matter or data of sense. Nowadays no one with psychological training would dream of so interpreting it. So far as adult experience, at least, goes, it is the perception which psychology regards as immediate and given, and the sensation which is the artifact. And yet the perception is nevertheless believed to have been generated by the organization of such given material of sense, and to remain existentially a complex of such elements in spite of its immediacy for our experience.

This doctrine, that sensations are existentially present in perception, like the doctrine that they are present in the infant's experience, has as one of its main supports the doctrine of specific energy. According to this doctrine, in its most generally accepted form, the different end-organs are normally excitable only by their own peculiar modes of external stimuli, and on transmitting the excitation thus produced to their respective cortical cells, mediate invariably their own peculiar sensation qualities. This being so, it follows that when a number of cortical cells are stimulated simultaneously (in such a way that coordinated functioning occurs) the perception mediated is a *complex,* containing these specific sensation qualities, slightly modified perhaps by their mutual interaction, but maintaining their essential specificities.

Now the essential inadequacy of the doctrine of specific energy one would suppose to have been made sufficiently manifest in Professor Dewey's article, "The Reflex Arc Concept," nearly twenty years ago. It surely is a doctrine which runs counter to the whole trend of present-day psychophysical interpretation. As Professor Dewey so forcibly urged, the reflex arc, from stimulus received to response evoked, is one unitary act or functioning of the nervous system. There is no possible reason for cutting the act in two and treating the passage of the excitation to sensory area in the cortex as an event by itself. As a purely mechanical process in space and time it may be regarded as a single event, but as forming a part of the behavior of a conscious being it is no event, nor any intelligible factor in such behavior. As well try to construct the human body from "elements" obtained by a process of repeated bisection, as to construct perceptual experience in terms of specific energies.

The psychological weakness of the doctrine of specific energy shows itself when the attempt is made to interpret in its terms the facts of attention. So far as direct observation shows, whether I see the blueness (or the blackness) of the ink with which my friend's letter is written, depends on whether I am attending to the color. I am very likely to read the letter in complete obliviousness to the color of the ink—I literally do not *see* the color, and if I try to remember afterward, I have not the faintest memory of it. And yet my reading the letter depended on the excitation of "blue" retinal end-organs and the transmission of this excitation to the proper cortical cells. According to the psychologist, this phenomenon is due to inattention and is explained thus: Even though I do not attend to the color of the ink, yet I am, nevertheless, experiencing the sensation "blue" as I look at the letter. The sensation which I have is in the *margin* of attention, but it is the same sensation which I should have if I attended to the color, and the sensation occupied the *center* of attention. The marginal sensation differs from the focal sensation in the attribute of "clearness" only, but this does not, it is assumed, alter its identity. But now let us ask what evidence can be brought forward to support this interpretation. What empirical grounds are there for the assumption that I was experiencing inattentively the sensation blue, when I read the letter? If introspection is to be relied upon, one must conclude that I had no experience of blue. As a matter of fact, the theory is confessedly beyond the reach of empirical verification, for the so-called marginal content is admitted to be open to memory-recall in the lowest degree.

A similar case is that of the hearing of the overtones in the notes of a violin or of a flute. I hear the notes of the violin and of the flute as distinctly different. After the proper training I can, when I attend, hear out the overtones which give each its characteristic quality. But what evidence is this that I was all along hearing (inattentively) these same tones? I should have said before my training that the difference between the violin tone and the flute tone was a simple difference comparable to that between red and orange. To suppose that nevertheless the content of my perception was an existential complex containing these overtones as elements is a perfectly gratuitous assumption, which raises vicious epistemological problems and explains nothing. To attribute the experienced difference between violin and flute to the experiencing of different sensations is in principle no better than Descartes's theory of vision, in which he explained the perceived difference in distance between two objects seen, in terms of the angles made by the lines of sight from the two eyes. Doubtless it is true that if the angles were not different in the two cases, the objects would not appear to be at different distances; and doubtless if the notes of the violin and flute were not objectively complexes containing the overtones they do, they would not appear as qualitatively different. But the latter is as irrelevant as the former, when used as a *psychological* account of the difference. Nor is the case altered because under the proper conditions I can *hear* the overtones, whereas I can never directly *see* the angles. The "proper conditions" (trained attention) are as necessary conditions of my hearing the overtones, as is the existence of the specific air-waves, or the stimulation of the auditory end-organs.

The theory then has the weakness of assuming existents lying beyond the reach of empirical verification. But as a conceptual construction it is equally open to criticism. The chief difference alleged to exist between the marginal and focal sensation is a difference of "clearness," which is accordingly treated as one of the "attributes" of sensation. But the *existent,* as such, can not be more or less clear. It is only of *meanings* that clearness is predicable. The essential attribute of the sensation is its quality—in fact, as has already been remarked, the sensation is nothing more nor less than an hypostatized *quality.* The attribution of clearness to the sensation seems to be due to an inevitable confusion arising from the attempt to treat experience in terms of the existential. I look at the wall-paper inattentively, and am able a moment afterward to recall its color vaguely as "gray," but what sort of gray—whether light or dark, yellowish or bluish—I am entirely unable to tell. The unclearness is truly predicable of my experience, if the experience is taken as a sensation *of* a determinate gray. One might describe it as *meaning* gray, and then the unclearness could be attributed to it. But the psychologist is forced by his presuppositions to suppose that my sensation, *i. e.,* an existent whose essence is quality, existed as an *indeterminate* gray—a patent logical absurdity.

And this brings us to the heart of the discussion. So far I have argued that, on the one hand, it is theoretically unfruitful to regard the sensation as an element of the percept conceived as an existential complex; and, on the other hand, that there is no empirical evidence possible for such a doctrine. Furthermore I have criticized the doctrine of specific energy in its commonly accepted form, urging that the experiencing of sensation-qualities depends as much on the condition of attention as on the stimulation of the appropriate end-organs and sensory cells, *i. e.,* on the part which the stimulated sensory cells play in determining the response. Not every discharge of a given set of sensory cells in the cortex yields the specific sensation-quality they are capable of mediating. The problem then is: Under what conditions are these sensation-qualities experienced, and how are these conditions related to the conditions under which perception occurs?

As has already been asserted, the point of departure for a theory of perception is the relation of sensation to behavior. Psychophysically this means that it is to the mode of functioning of the sensory cells of the cortex that we must look to discover the conditions of sensation. From the outset of conscious life in the individual the functioning of the nervous system is marked by the presence of inherited functional systems, the operation of which we call instincts. And just as the evolution of behavior takes place through the mutual inhibition and modification of instincts, so the complicated functioning of the nervous system which constitutes the conscious behavior of the adult has developed through the growing differentiation and coordination of the inherited functional systems. Thus it remains true that every nervous functioning is the functioning *of a system.* The discharge of cells in the sensory cells never dissipates itself indifferently, but always tends to follow some more or less determinate path or system of paths. Just what system of paths, and what particular path within that system will be chosen, depends on the attentive "set" of the cortex, as well as on the particular combination of sensory stimuli received in the various centers. The response, that is, is never a response to a single stimulus, or to a single object, but is always a response to the situation. Completely uncoordinated response is abnormal response. Stimuli are truly stimuli only in so far as they are coordinated. The normal nervous system is incapable of acting except through the operation of functional systems, mutually inhibiting, facilitating, and modifying each other in their action. We never perceive anything entirely unfamiliar; every sight and sound and feeling, however strange, has some character which places it for us, if only by its demand for further specific examination.

From the start, anything which acts as a stimulus at all tends to evoke some response. In the preceding article it was argued that just as the early responses are vague and uncertain, so the early stimuli must be experienced as correspondingly vague and indefinite. The adaptation of response to stimulus is rough, being direct and simple instead of indirect and complex. Just as the chick pecks at any small moving object, so the baby grasps at practically anything within its reach. But with the growth of the power of varied manipulation comes a new ability to discriminate between visual stimuli. Let us consider what this means in terms of nervous functioning.

At first the group of sensory cells in the visual area, for example, possesses a minimum of differentiation. The excitation of all alike is connected with responses controlling eye-movements. But soon there arises a differentiation of cells due to differences in retinal stimulation correlated with differences in location of the source of stimulation—the object seen. The child learns to turn eyes and head left or right, up or down, to look *at* the attractive light or object, as well as to fixate it for clear vision. This differentiation of the sensory cells of the visual center can, of course, develop only in coordination with muscular stimuli due to movements of eye and head muscles. As a result of this early development, there is a definite and quite simple functional differentiation of sensory cells in the visual center correlated with differences in spatial position of object seen. Certain combinations of visual cell stimuli, acting in conjunction with certain combinations of cell stimuli in other sensory centers, form functional units bringing about a response of definitely adjusted eye and head, and later, arm and hand movements.

Now this differentiation of visual cells corresponding to spatial localization is quite independent of any differentiation depending on difference in sense quality. Color-tone and brightness play no part in the development of spatial coordinations. Compared with the direct and simple functional differentiation of cells due to spatial differences, it might be said that there is no functional differentiation corresponding to differences in sense quality. And yet this would not be true, for the processes which bring about at once the development of behavior and the development of nervous functioning, issue as well in a very characteristic functional differentiation of sense-qualities. Although the cortical cells mediating red and green function indifferently in determining motor adjustments to spatial differences, and belong indifferently to the same functional systems in so far, yet they do not by any means always function indifferently, nor belong to all the same functional systems. On the contrary, they come to be members of a multitude of different functional systems, as it were by sheer chance. The color of a baby's ball may be red, and the paper on the walls of his nursery green; the flowers which he holds and smells are red, and the grass green; and so on indefinitely. That the thousand and one objects of daily life are colored as they are is a fact of little or no significance. The important classes into which the objects of a child's world fall (or our own, for that matter) are not characterized by colors. The "red" cells (or, if you will, the chemical process in the cortical cells which mediate red) *may* enter into almost any of the minor functional systems generated by the habitual surroundings of a child's daily life. The important point is that, as a matter of fact, they do come to enter into indefinitely different functional relations, just as do the "green," and "blue," and "yellow" cells. Each of these groups comes to be a unit in a multitude of functional systems, and a unit in a different multitude from every other. And the same is true in a greater or less degree of the different groups of cerebral cells mediating the sensation-qualities of the other sense departments. This peculiar characteristic which the sensory cells thus acquire I shall term *functional indeterminateness,* or *functional independence.* My hypothesis accordingly is that *the functional indeterminateness or independence of the sensory cells of the cortex is the essential condition of their mediating the experience of sensation qualities.*

This hypothesis, it is to be observed, is not offered as an alternative to the doctrine of specific energy, but as a supplement to it. That the different sense-organs, and the differentiated groups of end-organs belonging to the different senses should possess a selective capacity with reference to different physical stimuli, and that this nervous discrimination should be represented in the sensory cells of the cortex is, of course, a primary condition for the experiencing of distinct sense-qualities. But as it stands, the doctrine of specific energy is, as I have tried to show, hopelessly inadequate. The fact that certain groups of cortical cells are invariably stimulated by specific sorts of physical agencies is insufficient to account for the fact that we experience these agencies as qualitatively distinct. It is equally essential that these different groups of cells thus stimulated should possess characteristic and distinct functional relations. And such relations, as has been shown, they do possess.

The significance of the functional indeterminateness of the sensory cells must now be pointed out. It might perhaps be supposed at first thought that qualitative distinctness would depend on direct and simple functional differentiation. That is, one might suppose that it would be the stimuli which demanded specific and determinate responses which would be experienced as possessing specific qualities; and that two stimuli which evoked specifically different responses would be experienced as differing in qualitative specificity. But a little consideration serves to show that such a supposition would be ill-founded. If two stimuli habitually and therefore directly evoked specifically different responses, they would probably not be experienced at all. It is only the stimulus which is uncertain, and whose response awaits determination, that rises to consciousness. Our awareness of it, the degree of our attention to it, depends precisely on its *indefiniteness* as a determinant of response. The stimulus whose response is immediate and certain is one to which we have neither need nor power to attend. Attention means the holding of the gates of action in readiness, a checking of the impulse to act, and consequently an increased excitement of the sensory areas involved. But this is precisely the condition under which the distinctive character of the stimulus is experienced, the condition under which quality emerges.

With this in mind, we are now ready to define more nearly the relation of sensation to perception. The complete determinant of response, as has already been pointed out, is in every case the situation as a whole. The situation itself is constituted by two complex groups of factors—on the one hand, the previous "state of mind," the whole "set" of the cortex; and on the other, the group of stimuli reaching the cortex through various avenues, so far as these are coordinated. (If any fail to enter into coordination they are not experienced at all.) Now this second group has a structure of what we may call the second degree of complexity. That is, the factors into which it naturally falls are themselves complex—they are themselves objects of perception, functional units which maintain their integrity from situation to situation. Let us take an illustration. My behavior at breakfast is a response to the whole breakfast-situation. I come downstairs when the bell rings and take my accustomed seat, greeting the other members of the family as they take their accustomed seats. I stir my cup of coffee, putting in two lumps of sugar, and pouring cream from the pitcher at my right, etc. Now I should not give these same responses to any of the factors of this situation on any other occasion than breakfast. If I meet my brother later in the day, I accost him differently. If I enter the dining-room in the middle of the morning, I do not seat myself in the same place, nor, if a cup is on the table, do I go through the same series of acts. Yet these factors—my brother, the chair, the cup, etc., are each and all functional units. My brother is my brother wherever and however I see him, and he is the object of characteristic behavior on my part. And similarly with the chair or the cup. The various combinations of visual and tactual and muscular and temperature stimuli arising from a dining-room chair are so coordinated that they form a functional unit, which, although "structurally" complex, maintains its integrity in all but unusual circumstances. However much I may hesitate and reflect as to how I shall act toward the chair, I rarely consider treating it except *as* a chair. My hesitation may cause me to observe the crack in its leg, or the hole in its leather seat, and I may avoid using it, and put it aside to send away for repair.

Now, under all these conditions, I probably have at no time been aware of a single one of the numerous sensations, or sense qualities, which the chair-group of stimuli would ordinarily be said to include. When I touch it, I do not feel the slight cold, nor, as I look at it, do I see the changing hues and tints and brightness of its surface. As Professor Pillsbury has said somewhere, "we see in terms of meaning," and these sensation elements have no relevance to the chair or its condition. But let me enter the dining-room engaged in reflection on psychological analysis, and a new and very unusual situation has arisen. The table and chairs and cups are not the factors of this situation, and all my customary modes of response to these coordinated groups of stimuli are inhibited, and the integrity of the common functional units is broken down. As I look at the chair, I no longer see the *chair,* but the variegated patches of color, and as I touch it I feel the pressure and the cold. But this could not happen if the cortical cells stimulated by these diverse end-organs in retina and muscle and skin did not possess functional independence. It is only because each of these groups of cells belongs in a great variety of functional units, *i. e.,* perceptual systems, that its functioning in the chair-percept can be inhibited, and its own individual quality flash out. Thus while under ordinary circumstances a group of sensory cells capable of mediating a specific sensation quality functions only as a factor in some functional unit, it may, because of its very independence, become determinative of response by functioning as a unit itself. This happens in such children's exercises as the sorting of colored worsteds, or similar Montessori games; and it always happens in the psychological laboratory in the numerous experiments where the response of the observer varies with changes in sensation quality.

Perhaps it will serve to make clearer what is meant by functional independence if we contrast the sort of functional differentiation possessed by sensory cells in the cortex connected with contiguous warm and pressure end-organs on the hand, for example, with the differentiation possessed by cortical cells connected with warm end-organs on the two hands, respectively. The former mediate sensations of the *same "local sign,"* but of *different sensation quality;* the latter mediate sensations of *different "local sign,"* but of the *same sensation quality.* Now in the former case, the "contiguous" warm and pressure cells in the cortex have the *same direct* functional connections. They both alike and indifferently evoke the same lower-level responses of touching the back of the hand with the other, of looking at it, etc. But their *indirect* functional connections are indefinitely *different.* For more complex behavior than the mere touching and looking at the spot, it makes a great deal of difference whether the stimulus is felt as warm or merely as a pressure which excites no temperature sensations. If I am alone in my room in the dark, for example, and the back of my hand comes in contact with something *warm,* I may perhaps shriek in terror. It all depends on the situation, of course, but in similar situations warmth and pressure may lead to very different sorts of behavior.

In the second instance, where the cells stimulated are connected with the warm end-organs on the two hands, the case is just reversed. The more *direct,* lower-level connections are *different,* mediating different simple responses, while the more *indirect* and complicated connections are *similar.* Alone in the dark room, the warmth on one hand is just as terrifying as on the other. One serves as well as the other to initiate the behavior appropriate to "something alive in the room." Broadly speaking, other things being equal, difference of sense-quality in the stimuli means a difference in general character of objective conditions, and a corresponding difference in the sort of conduct appropriate; while difference in local sign, other things being equal, means a difference in the relative position of external objects, and a corresponding difference in the specific modification, or detailed adjustment, of the already indirectly determined general response.

According to the hypothesis put forward in these pages, there is no isolable element of "local sign"' to be found by introspection, no specific difference in quality between the pressure on one spot and the pressure on another, precisely because their functional differentiation is of this direct sort, and not of that indirect sort which has been designated functional independence. The experienced difference between two differently located pressure spots can be described only in terms of difference of meaning. One might almost say that it is experienced as a simple and immediate difference in meaning! The only thing existential, the only thing one can lay one's finger on when one attends to a pressure sensation, is its *quality.* And this is precisely because the specific determination of response due to its local sign does not fall within the control of attention. You can not imagine a pressure, or a warmth, or a cold, or a pain on or in the tip of your left ear, without an image arising of a movement of the hand to the spot, or, more probably, without actually feeling the slight anticipatory muscular strains; and you are certain to hold your head tense. But you can imagine the quality of warmth or cold, if it be not localized, without feeling an impulse to any response whatever. Or, perhaps a better illustration (since it is difficult to imagine the temperature qualities)—think of a bright spot, or a colored spot, at the extreme left of the field of vision. You have inevitably an image—or the actual beginnings—or an eye-movement in that direction. But you can vividly imagine a deep sapphire, or a pearl gray, as such, without any such inhibited responses, for, as sense-qualities, they tend to call out none in particular.

In conclusion, there are a number of observations to be made regarding the general significance of the hypothesis presented in the foregoing pages. In the first place, if this hypothesis be well-founded, the psychological doctrine that the sensation is an element or a constituent of perception, at least in any such sense as it is now held, must be given up. So long as the sensory cells are acting as elements in a functional unit—while, that is, their action is so coordinated with the action of other sensory cells as it is in perception, they are not mediating the sense-qualities of which they are capable. For the functioning of the group as a whole, since it is a *functioning,* and not merely a "chemical discharge," is not in any sense a resultant of the functioning of the separate cells which compose it. The condition under which the constituent cells of the group may mediate their distinctive sense-qualities is the disintegration of the functional group, and the *independent* functioning of the cells in question. Each perception or perceptual act is mediated, however, by the unified functioning of a more or less variable complex group of sensory cells, and is thus correlated with a more or less variable group of sensation qualities. Accordingly, when the perception is lost through a shift of attention, the sensations that flash out will fall within this group. This much may then be said: Given a determinate set of peripheral excitations, there *may* be experienced any of the specific sensation qualities corresponding to the group of sensory cells excited. Whether *any* of this group, or *which* members, if any, are actually experienced, depends on the functional systems thrown into play within the cortex.

In the second place, from the standpoint of this hypothesis, it is possible to reach a new, and I venture to think a more fruitful, conception of the nature of psychological analysis and introspection.

Thirdly, it offers a new approach to the psychological problem of meaning (a problem vital to any general theory of the nature of consciousness) which, I again venture to think, would free it from many of its time-honored difficulties.

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